February 2021

WWR Medical Guideline

Sports Nutrition

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20 February 2021

The physiology of exercise includes more than just energy production. Athletic performance depends on proper nutrition for growth and development and for effective immune system function. Our understanding of the interrelated roles of dietary carbohydrate, protein, and fat on athletic performance has increased tremendously in the past decade. The implementation of these new understandings and practices uniquely specific to varying levels and areas of sport, have gained attention and trust given their effectiveness in performance, recovery, and general health in the wheelchair (WC) rugby population.

NUTRITION IN ADAPTIVE SPORTS

Sports nutrition concepts and practices have significantly evolved over the past two decades. Presently, nutrition recommendations are tailored specifically to each athlete based on a number of factors including age, gender, sport, training status, body composition, and sporting goals.

While individualized nutrition prescription is of high importance in all sports, it is more crucial in the WC rugby population due to athletes' varying metabolic, clinical, and practical needs associated with their level/type of injury/impairment. Sports nutrition can be applied across the spectrum of athletic endeavor; from the developmental athlete, to general fitness and weight management, to the elite performer.

Nutrition goals within adaptive sports generally include an achievement of optimal training capacity and performance, achievement of appropriate body composition, promotion of health and wellbeing, decreasing the risk for illness and/or injury, all while preserving a healthy relationship with food and overall "food experience."

TRANING NUTRITION GOALS

Just as an athlete will complete appropriate medical clearance and assessment by a physician, physical therapist, and/or occupational therapist, a thorough nutrition assessment is essential. A complete nutrition assessment creates a strong foundation for WC rugby athletes to maximize training, performance, and overall health. This should be conducted by a qualified practitioner (sports dietitian or equivalent) with experience in Para Sport.

An in-depth nutrition assessment and nutrition-focused physical exam includes the evaluation of:

- **Anthropometric measurements**
    - Height
    - Weight (using appropriate scales, such as roll-on or wheelchair scales)
    - Waist/limb circumferences (where practical)
    - Body fat distribution (DEXA scan, skinfold measurements [if appropriate/available])
    - Usual body weight/weight history
- **Pertinent conventional and functional laboratory markers (CBC, HgbA1c, glucose, lipid panel, iron parameters including ferritin, Vitamin D, etc.)**
- **Complete medical history (including level of injury/type of impairment, etiology of impairment, time of onset, etc.)**
- **Gut function (history of injury/surgery, consideration of level of spinal cord lesion, etc.).** Higher level spinal cord injuries slow gastric emptying times, which influences appetite and tolerance of foods and fluids around exercise. Further, alterations in fiber content of diets need to be carefully managed.

- **Current dietary habits including food preference, eating environment, as well as food allergies, intolerances (confirmed or suspected), or sensitivities (confirmed or suspected)**
- **Assessment of total caloric and macronutrient intake (protein, carbohydrates, and fat), hydration status (water/fluid intake), and micronutrient distribution (vitamins and minerals)**
- **Medication/supplement review**

DETERMINING CALORIC NEEDS

Estimating energy expenditure and energy needs of an athlete can be a complex task, even if measurement tools are individualized. Given the complexity of varying injury/impairment levels, estimating energy expenditure in WC rugby athletes can pose even more difficulty, especially since wearable technologies aren't valid for most WC rugby athletes.

Resting energy expenditure of international level wheelchair rugby players have been measured to range from 1324-2068 kcal/day, and are higher than less well-trained players. The variation in requirements is predictably large due to differences in the presence or not of a spinal cord injury (highest in non-SCI players), and the level and completeness of spinal cord lesion. There are also large variations in energy expenditure of exercise according to impairment, training status, and the player's role on the field of play. An experienced nutrition practitioner will be able to use tools available to them including prediction equations (e.g., Cunningham) or indirect calorimetry to estimate the individual caloric needs of players in order to guide dietary intake. However, it's generally useful to simply start with the current intake of the athlete and make adjustments from there, especially if they're fairly weight stable. Over time, the practitioner and athlete would work together to adjust these estimated needs (including breakdown of macronutrients) based on performance, and training capacity/ consistency and body composition changes.

PERFORMANCE NUTRITION FOR WHEELCHAIR RUGBY

Hydration

Commencing exercise in a well-hydrated state is important, as is maintaining appropriate hydration across the day, especially when traveling. Urine color and output volume is a practical indicator of hydration status. Some athletes may deliberately restrict their fluid intake prior to training due to the practicalities of toileting once strapped-up and in their playing chair, hence educating athletes around the importance of adequate hydration status for both performance and health and working with them to develop a more effective hydration plan is essential.

Many athletes competing in WC rugby have a Spinal Cord Injury (SCI) which results in impaired sweating and blood flow responses to exercise, causing increased heat strain. These athletes will tend to have much lower sweat rates (sometimes no sweat response), resulting in lower fluid requirements. Therefore, unlike many able-bodied sports, the messaging around hydration is distinctly different. Athletes may need to utilize cooling strategies prior to and during exercise to manage heat stress (e.g., iced-towels, spray bottles, and fans), rather than simply 'drinking to thirst'. It is important for practitioners and athletes to understand their individual fluid needs by undertaking sweat rate testing during training sessions, and set fluid intake plans accordingly. Prior to exercise, athletes should practice regular voiding of the bladder/catheter bag so as to decrease pressure on the bladder during the event (and decrease the likelihood of autonomic dysreflexia as much as possible). In some instances, fluid intake may need to be reduced to better match sweat rates and reduce the risk of autonomic dysreflexia.

Fuel

The determinants of an athlete's need to consume fuel throughout the day, and specifically prior to, during, and after training include their training status (the intensity, type, and duration of training session), timing of subsequent training sessions, purpose of training sessions, as well as lifestyle activities (what is done outside of sport/training). Due to the large physiological differences between athletes, fueling strategies

must be tailored to each individual. A sports nutrition practitioner can educate the athlete on how to appropriately select specific foods to best fit their needs during training, competition, and recovery periods.

Carbohydrate is the predominant fuel used during moderate to high intensity exercise. Since wheelchair rugby involves bursts of high intensity activity with short rest periods in between, it is important to ensure adequate carbohydrate supply. The amount and timing of this carbohydrate in the diet depends on how often the athlete is training – more is required when there are multiple training sessions or games in one day (such as at a training camp or tournament). For athletes who are training 2-3 days per week and playing once a week, consuming a source of carbohydrate at each meal throughout the day will be sufficient for fueling needs. Athletes who train/play more than once a day will need to increase their carbohydrate intake and be aware of timing it effectively before exercise, in the recovery period after a session, and potentially during a training session/game (such as a carbohydrate-electrolyte drink, banana, or bar). Nutrient-dense, carbohydrate-rich foods include fruit, starchy vegetables (e.g., potatoes, carrots, turnips, corn), legumes, whole-/sprouted grains (e.g., rice, quinoa, millet, barley, oats, and grain products [crackers, bread, etc.]), and some dairy products (yogurt and milk).

Protein

Protein plays an important role in promoting muscle recovery and adaptations after exercise, growth and development, and immune function. Distributing moderate servings of protein intake evenly throughout the day, including post-training, optimizes day-to-day recovery from training sessions. Protein-rich foods include meat, poultry, fish/ seafood, eggs, dairy products, nuts/seeds, and legumes.

Post-Exercise Recovery

Consuming ~20 grams of high-quality protein within 1-2 hours after exercise helps to boost the training response. This can be provided as a fluid, snack, or as a component of a meal. It is often observed that post-workout fuel in the form of a liquid is well-tolerated, transportable, and easy to administer (e.g., smoothie made with frozen fruit, leafy greens, nut butter, seeds [e.g., chia seeds, ground flax seeds, etc.], and liquid such as water, coconut water, cow's milk, or nut milk; if appropriate, protein powder [or equivalent] may be added to help meet macronutrient needs).

Other Nutrients

Exercise induces oxidative stress, which is also one of the mechanisms that drives adaptations to training. Oxidative stress which isn't balanced by protective nutrients can also lead to the damage or modification of immune cells resulting in impairment of function. Consuming antioxidant-rich foods such as brightly colored or deep-pigmented fruits and vegetables every day helps to ensure that the stress of exercise is managed effectively for athletes. Taking a food-based approach helps athletes achieve all their nutrient needs for performance and well-being.

Probiotics have been associated with improvements in gut barrier function, an important first line of defense in the immune system. Daily probiotic intake (in addition to adequate prebiotic fibers) through the diet or a prebiotic supplement and can enhance the immune system, improve intestinal tract health, and reduce the prevalence of allergy in susceptible individuals. Given the synergistic effect between food compounds and probiotic cultures, fermented dairy products (e.g., Greek yogurt, kefir, aged cheese, etc.) provide an excellent food-based source of probiotics. Other sources of probiotics include fermented foods (e.g., kimchi, sauerkraut, pickles, natto, miso, etc.) and kombucha. Quality prebiotic-rich foods include artichokes, asparagus, dandelion greens, bananas, leeks, garlic, onion, ground flaxseed, jicama, and legumes. Probiotic supplements containing a wide variety of probiotic strains may be utilized especially when athletes are traveling for training and/or competition, but should be commenced at least 2 weeks prior to travel to ensure the athlete's gut has adjusted to the change in bacterial balance.

While it is classified as a fat-soluble vitamin, vitamin D acts functionally as a hormone. Vitamin D plays many vital roles in the body and is most recognized for optimizing bone health through its role in the uptake of calcium into bone. However, vitamin D is also important in supporting immune function and muscle

strength. Practitioners and athletes should consider several factors when evaluating vitamin D status including: athletes who train predominantly indoors (less exposure to UVB radiation), live at latitudes >35 degrees north or south of the equator, expose relatively small skin surface area to sunlight, have dark skin color, and/or are overweight/obese as each of these factors can greatly determine how well an athlete is absorbing and utilizing the vitamin. Lab testing can help determine levels and whether supplementation may be necessary. An in-depth dietary intake and lifestyle questionnaire can also help to determine risk of low status. It is possible that athletes can obtain appropriate vitamin D from safe sun exposure (UVB rays) and foods such as mushrooms, dark leafy greens, pastured eggs, wild salmon, etc. However, if an athlete lives in a cooler climate (further from the equator) and/or confirmed deficiency exists, supplementation with vitamin D is often necessary but should only be taken according to blood Vitamin D status results.

SAMPLE MENU FOR WHEELCHAIR RUGBY ATHLETES

Based on both athletic and health-related goals and performance output, athletes should have their individual calorie and fluid needs measured/estimated by an experienced sports nutrition practitioner. The below menu provides a framework of eating patterns and meal composition across the day.

Build meals with the following general guidelines:

Breakfast/Lunch/Dinner:

- **Carbohydrate source** – e.g., fruit, starchy vegetables (e.g., potatoes, carrots, pumpkin/squash, peas, etc.), whole-/sprouted grains (e.g., quinoa, millet, rice, oats, corn, etc.), legumes, etc.
- Note: The amount of carbohydrate should reflect the training loads.
- **Protein source** – e.g., chicken, turkey, fish/seafood, red meat, eggs, legumes, tofu, dairy, and nuts/seeds
- **Non-starchy vegetables** – e.g., spinach, kale, capsicum/peppers, celery, cucumber, onion, radish, Brussels sprouts, green/red cabbage, cauliflower, eggplant, etc.
- Note: Ensure variety and different colors
- **Nourishing fat source** – e.g., avocado, raw nuts, seeds, oil (avocado, walnut, olive, coconut, etc.), salmon, egg yolk, dairy
- **Water**

Snacks:

- Pair carbohydrate source with quality protein/fat source if possible
- Pre-training: Carbohydrate foods should form the basis of pre-training snacks. If your training session falls after a meal (e.g., mid-morning), it may be that your previous meal will serve this pre-training purpose (i.e., breakfast). If a snack is required, simple snacks (that pair carbohydrate with a protein/fat source) such as a piece of fruit with nut butter or raw nuts, crackers with spread, dried fruit with cheese, or a nutrient-dense bar are appropriate. Gut comfort of the athlete should always be considered with pre-training food choices.
- Post-training: Protein (~20 grams) should form the basis of your post-training snack or meal and should be consumed within 1 to 2 hours of training. If a meal is not due within this time, practical snacks include high-protein yogurt, a wrap with protein filling, or a smoothie.

SAMPLE MEAL PLAN

Breakfast

- Oatmeal: Oats (rolled oats, cooked in water, cow's milk, nut milk, or equivalent)
- Toppings: Natural nut butter, raisins, cinnamon, etc.
- Fresh berries (strawberries, blackberries, blueberries, raspberries, etc.) or other fruit
- Egg(s) (scrambled, hard-cooked, poached, over-easy, etc.) with sauteed greens or other vegetable(s)

Snack

- Yogurt bowl:
- Plain Greek yogurt
- Nuts and/or seeds (e.g., ground flax seed, pumpkin seeds, chia seed, etc.)
- Fresh berries (strawberries, blackberries, blueberries, raspberries, etc.) or other fruit

Lunch

- Sandwich/wrap:
    - Whole-/sprouted grain bread/wrap/tortilla/etc.
    - Turkey, chicken, beef, or other quality protein source
    - Add leafy greens, tomatoes, cheese, etc.
    - Dill pickle or sauerkraut
- Side salad
- Stir-Fry
    - Chicken, turkey, beef, fish/seafood, or other quality protein source
    - Vegetables
    - Rice/noodles
- Fruit
- Kefir

Snack

- Smoothie:
    - Frozen cherries or berries
    - Banana

- Natural nut butter
- Chia seeds, ground flax seed, etc.
- Spinach or other leafy greens
- Water, coconut water, cow's milk, nut milk, or equivalent
- *Note: Add protein powder or equivalent if appropriate*

- Raw nuts (almonds, walnuts, pistachios, cashews, pecans, etc.)

Dinner

- Wild-caught fish (or other quality protein source)
- Baked potato or other starchy carbohydrate source
- Fresh fruit
- Non-starchy vegetable and/or salad: Salad greens (spinach, kale, collard greens, Swiss chard, arugula, etc.), sliced vegetables, raw nuts/seeds, vinaigrette dressing
- Dark chocolate (>70% cocoa)

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References:

Broad, E. (2019). *Sports Nutrition for Paralympic Athletes* (2nd ed.). Taylor & Francis.

Broad E.M., Newsome L.J., Dew D.A., Barfield J.P. Measured and predicted resting energy expenditure in wheelchair rugby athletes. *J. Spinal Cord Med.* 2020;43:388-397.

Karpinski, C., & Rosenbloom, C. (2017). *Sports nutrition: A handbook for professionals* (Sixth ed.). Chicago, IL: Academy of Nutrition and Dietetics.

Pritchett K., Broad E., Scaramella J., Baumann S. Hydration and cooling strategies for Paralympic athletes. *Curr. Nutr. Rep.* 2020;9:137-146.

Thomas DT, Erdman KA, Burke LM. Position of the Academy of Nutrition and Dietetics, Dietitians of Canada, and the American College of Sports Medicine: nutrition and athletic performance. *J Acad Nutr Diet.* 2016;116(3):501-528. PMID: 26920240 www.ncbi.nlm.nih.gov/pubmed/26920240.